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MAGNETIC CONVEYOR BELT SHOT PEENING MACHINE

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INTRODUCTION

A magnetic shot peening machine based on the property of magnets to attract steel shots and propel the shots towards the work piece with the help of conveyor belt has been prepared The machine proposed by Dixit and Bharadwaj (1) uses magnetic pole plates with permanent magnets, underneath the run of conveyor belt as shown in Fig.1 and Fig. 2. The machine also required a magnetic wheel so that the shots , picked from the hopper, could be moved to the upper wheel for propulsion shown in Fig.3. This system has been modified by the magnetic wheel .

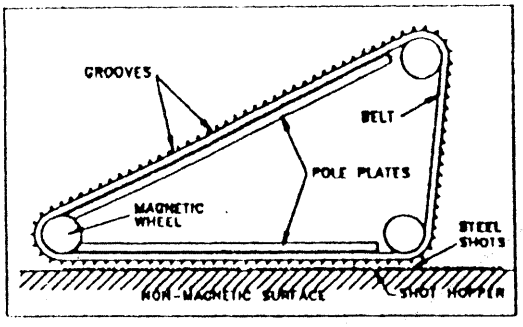

Fig.1. The arrangement of belt over wheels.

The present system uses rubber belt with magnets on its surface to hold the shots. A strip of thin nylon ribbon coverts the magnets and helps in releasing the shots. The assembly of the two belts passes from two wheels and one of them is attached to drive. This system is more economical and simpler in design .

Theory

A flat conveyor belt can be used to carry steel for the purpose of peening. The grooves on upper surface of the belt occupy the shots. The shots the proposed [1] machine uses following components:

1 Conveyor Belt, 2. Wheel, and 3. Magnetic pole plates.

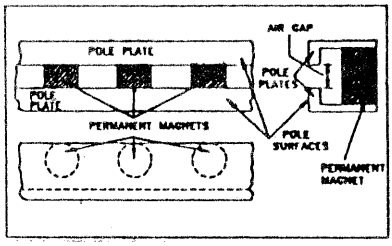

Fig.2. The arrangements of magnets and pole plates.

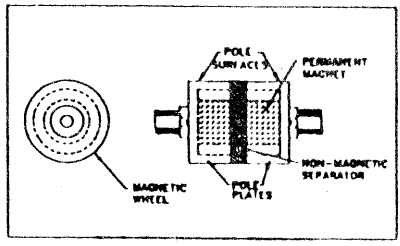

Fig.3. The magnetic wheel.

1. Conveyor Belt

This belt is made of flexible non-magnetic material and has grooves on its upper surface. The shots fill the grooves and are held in place due to the magnetic force applied by the underlying magnetic poles.

2. Wheel

The proposed machine [1] has three wheels. Two wheels are at the bottom and one wheel is at the top. The conveyor belt passes from the three wheels. The wheel located at the top. The conveyor belt passes from the three wheels. The wheel located at the top propels the shots at the work piece. Of the two wheels at the bottom, one is connect to the drive and, the other is a special magnetic wheel. The magnetic wheels has been used to hold the shots against the centrifugal force and shots are carried to the upper wheel for peening.

The construction of the magnetic wheel is shown in Fig. 3. The wheel consists of a solid cylindrical permanent magnet placed axially at the centre of the wheel. The two ends of the magnets are joined to two pole plates. The drive wheel connects to the motors and imparts motion to the assembly. All wheels made of non-magnetic material.

Proposed Working of Conveyor Belt Shot Peening Machine

The magnetic force exerted by the permanent pole plates [1] behind the non-magnetic flexible belt holds the shots against the belt surface in grooves. this condition is maintained till the shots arrive at the top wheel. Here due to the absence of magnetic force the shots are released toward the work piece.

The shots are propelled at the linear velocity of the conveyor belt. The shots velocity can be controlled by the controlling the speed of drive. The maximum quantity of shots is limited by the weight carrying capacity of the conveyor belt. The shots after striking at the work piece return to the shot hopper and are recycled back for peening.

The advantages of proposed machine are given below :-

1. The machine is cheep and portable.
2. The wear is minimized due to less relative movement of the shots.
3. A variety of the shots size can be used.
4. Economical due to low maintenance.,
5. Reliable due to simple mechanism.
6. Easily assembled.
7. Using electro-magnets in place of permanent magnets flow control is possible.
8. Shot control velocity possible by controlling the speed of the drive.
9. Low noise.
10. In built non-magnetic dust separator.
11. The system can be used in place of conventional shot elevator.

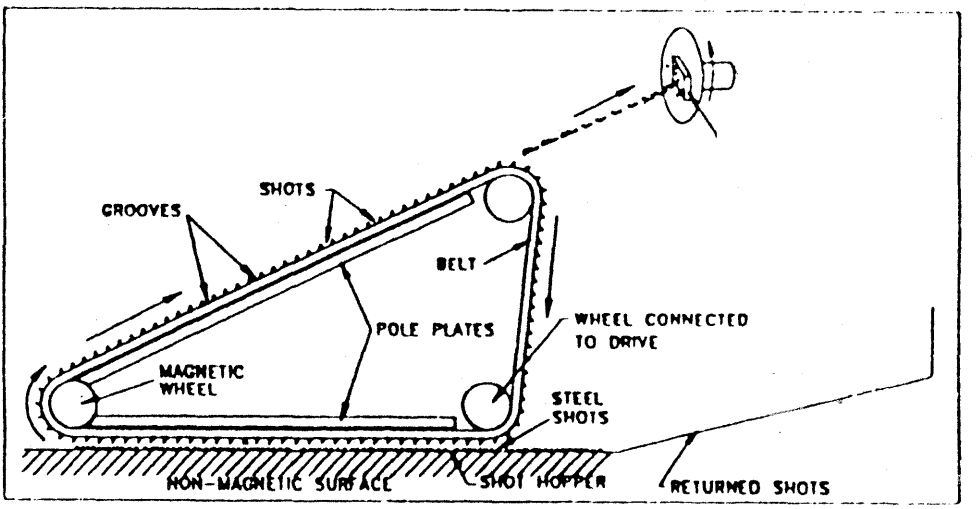

Fig.4. The returned shots directd at the work piece.

THE PRESENT WORK

Modification in the Conveyor Belt:

The conveyor belt has been modified by placing small permanent magnets on its surface shown in Fig. 5, such that the magnets hold shots directly, instead of heavy pole plates, as was used in the previous design. Another belt of nylon ribbon covering the magnets is used. The nylon ribbon helps to remove the stuck shots from the surface of the magnets.

Elimination of Magnetic Wheel

The magnets on the conveyor belt carry shots to the upper wheel these magnets also hold shots against centrifugal forces. Therefore a magnetic wheel is not required which has been proposed in the earlier machine.

Using Additional Wheel to Release Shots

An additional wheel is required in the present design to separate the shots from the magnets by nylon strip as shown in Fig.6.

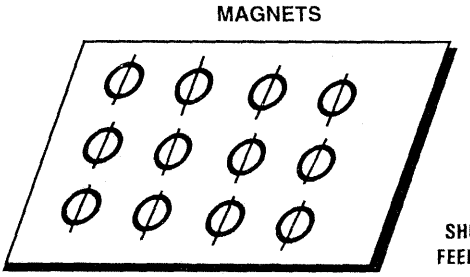

Fig.5. Magnetic Belt.

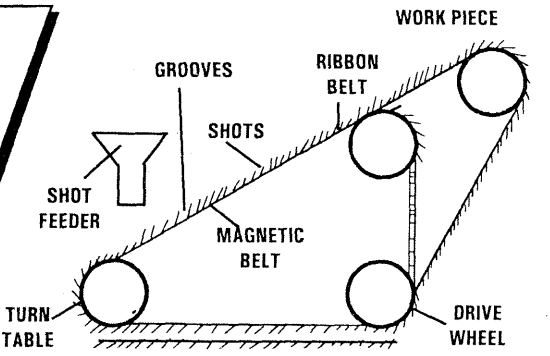

Fig.6. Modified Magnetic Shot Peening Machine

Feeding Shots on the Surface of Conveyor Belt:

The mechanism in which shots are picked from the hopper limits the quantity of shots, due increased speed and allowance of air gap along the height of aluminium strip stoppers on the nylon belt. The present machine uses a system of feeding shots on the surface of the conveyor belt directly.

Simpler Assembly by Placing Wheels in Single Linear Frame

The wheels can be placed in a linear fashion as shown in Fig.2, such that they are easily mounted. This is simpler and allows flexibility in adjustments which can be performed during peening.

The machine still has advantages listed as before, in the published machine, besides it is cheaper than the previous machine, the over all weight of this machine is also less than the previous machine. This machine is more efficient, and has low noise than the proposed published machine.

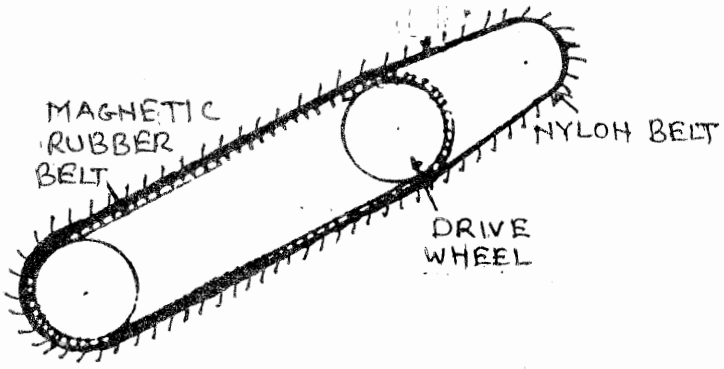

Fig.7. Simplified Magnetic Shot Peening Machine

References :

1. Dixit, A. and Bharadwaj, S.K. "Magnetic Conveyor Belt Shot Peening Machine", International Conference on Shot Peening and Blast Cleaning. M.A.C.T. Bhopal, India, 1996.